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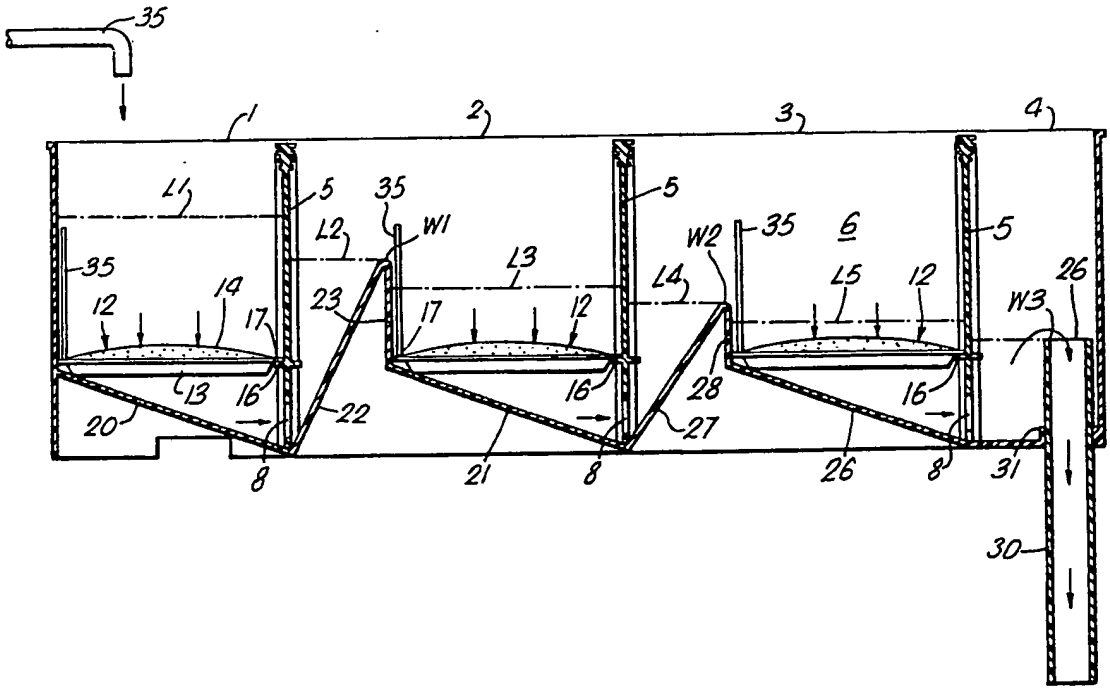
(54) Aquarium filter

(57) A filtration tank 1 with inlet 35 is divided into four compartments 1, 2, 3 and 4 by removable partitions 5. Each compartment includes a filter 12 supported at 16 on a respective partition 5 and at the other end by the tank floor which also defines two weirs W1 and W2. These weirs, and a third weir W3 defined by the top of a removable rectangular outlet tube 30, maintain water levels above the respective filters and ensure uniform flow therethrough. Each partition 5 is formed at the bottom with holes 8 for the flow of water from one compartment to the next and at the top with small holes which permit, overflow if the filter becomes clogged, indicating that the filter needs changing. Each filter 12 comprises a perforated plastics tray 13 holding granulated carbon enclosed by a layer of plastics foam and floss 14 and has a strip 35 enabling the filter to be lifted from the compartment.



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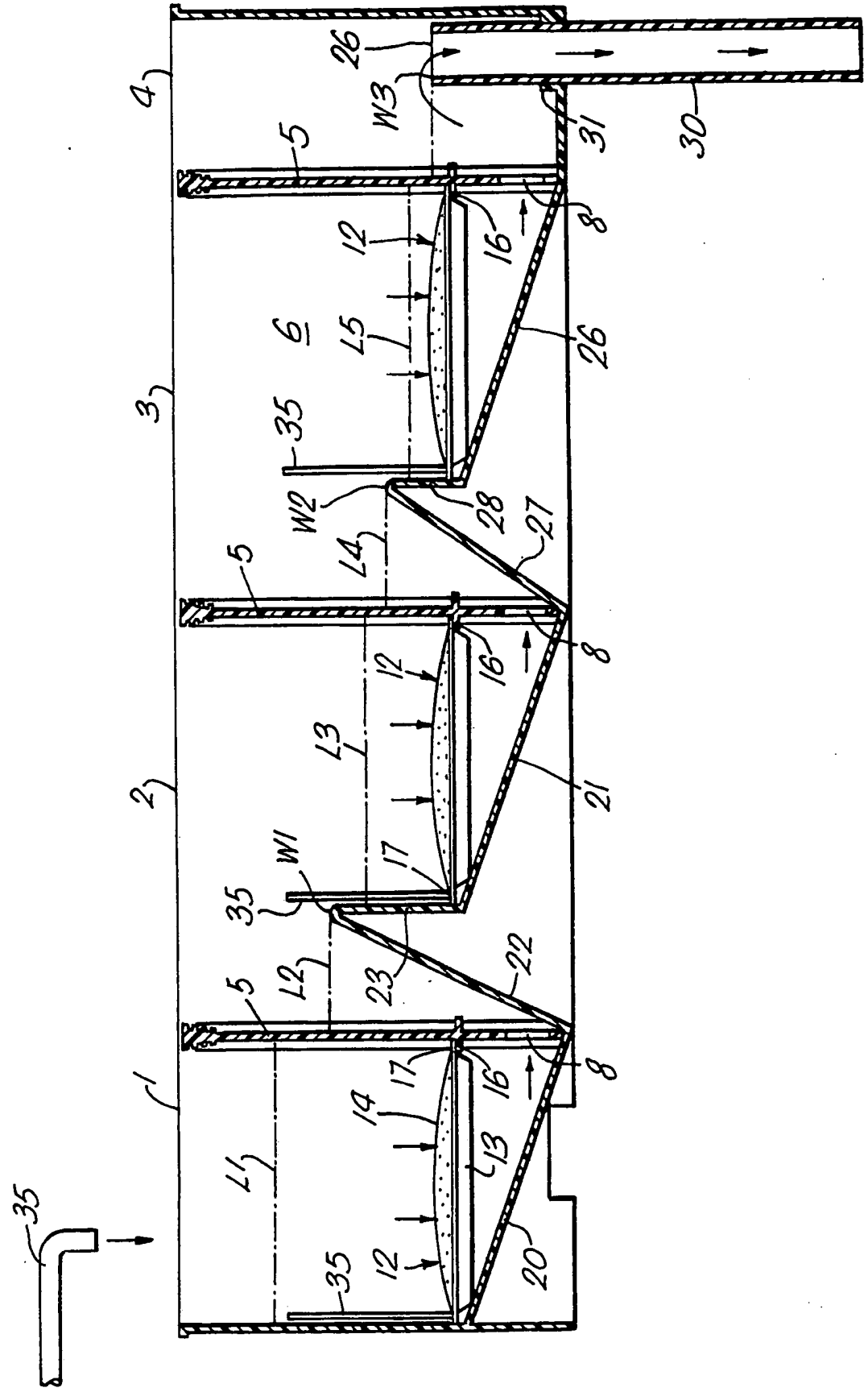

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WATER FILTRATION APPARATUS

This invention relates to the filtration of water from fish tanks in order to keep them clean and healthy. The normal practice is to withdraw water continuously from the tank, pass it through a filtration system and then return it to the tank. The filtration system may itself comprise a tank fitted with one or more filters, and owing to the continuous action, these require periodic cleaning. However, it is found in practice that the flow of water through the filters is uneven, leading to dead spots on the filter and, as a consequence, the filters need to be cleaned more frequently than would otherwise be necessary. Moreover, the active material of the filter is usually granular carbon which is dirty to clean or replace.

According to the present invention, a filtration device for this purpose comprises a tank divided into at least two compartments by a partition which is perforated towards the lower edge to permit flow from one compartment to the other, the first compartment having supports for a generally horizontal filter element and the second compartment including a weir extending to a level above that of the filter element in the first compartment so that, during operation, when water flows into the first compartment and through the filter element the water level will rise to that of the weir and the filter element will be completely submerged. Water from the fish tank is directed into the first compartment and since the filter in that compartment is completely submerged, the in-flowing water does not strike the

filter directly, but merely adds to the water already in the compartment with the result that the flow of water through the filter element is substantially even across the whole of its area and no dead spots arise.

Preferably the filtration tank includes one or two additional compartments, each with its own generally horizontal filter, the additional partitions being perforated towards their lower edges as just described, and weirs being provided to ensure that each successive filter is completely submerged so that the flow is even and dead spots are avoided.

Thus in a particular example of filtration tank in accordance with the invention, there are four compartments, the first three of which are fitted with filters and the fourth of which includes a weir and an outlet from which the filtered water returns to the fish tank. For cleaning purposes, the partition or partitions are made readily removable and the outlet which may also define the final weir is also conveniently removable. Each filter element is preferably a sealed unit comprising a plastic tray with a perforated base which contains the granular carbon and a cover of floss which keeps the carbon in position and avoids the direct handling of carbon. Preferably each filter unit is provided with a handling strip which extends from the unit and enables it to be lifted out of the tank without handling the filter unit itself.

An example of filtration tank in accordance with the invention will now be described with reference to the accompanying drawing which is a side view of a tank with one side removed.

The tank is divided into four compartments 1, 2, 3 and 4 by three removable partitions which are located in grooves in the opposite sides of the tank, one of which is seen at 6. The partitions are relatively

loose fits in their grooves and can be readily slid upwardly to remove them from the tank. Each partition 5 is formed along its bottom edge with a row of holes, one of which is seen at 8 in each partition. Although not seen in the drawing, the size of the holes varies from one end of the row to the other so that there is greater flow of water at one end than the other. By arranging the partitions so that the larger holes are alternately at opposite sides of the tank, a zigzag flow of water may be obtained, leading to a swirling action and more efficient operation of the filters.

The filters are shown as 12 and each comprises a plastics tray 13 which holds the granulated carbon and is formed with a perforated bottom to permit flow of water. The granulated carbon (not seen in the drawing) is enclosed by a layer of sponge and floss 14 so that it is completely enclosed and is clean to replace.

Each partition 5 is formed with projections 16 across its width which support one end of a rim portion 17 on each tray 13, the other end of each tray being supported by a sloping bottom to the compartment so that each filter element 12 is substantially horizontal. In compartment 1, the sloping bottom is shown as 20 and slopes from left to right across the whole width of the compartment. In compartment 2 the sloping bottom is shown as 21 and forms a continuation of a moulded strip having a steeply sloping portion 22 and a vertical portion 23 which between them define a weir W1. In compartment 3 the sloping bottom is shown as 26 and forms a continuation of a moulded strip having a steeply sloping portion 27 and a vertical portion 28 which between them define a second weir W2. In compartment 4 there is no filter and no sloping bottom, but a third weir W3 is defined by the edge of a rectangular outlet tube 30 which fits an opening in the bottom of the

compartment, being prevented from downward movement by a projection 31 which engages the bottom of the tank, but being capable of upward withdrawal for cleaning purposes.

In operation, water flows into compartment 1 through an inlet pipe 35 and under steady operating conditions the water level builds up to L1. In compartment 2 the weir W1 defines a second water level L2, the head defined by the difference between the levels L1 and L2 forcing the water to be filtered downwardly through the filter 12 as indicated by the arrows. Owing to the fact that the filter is completely submerged and the water from the pipe 35 does not strike the filter directly, there is substantially even flow across the whole area of the filter and no dead spots occur.

Having passed through the filter 12 in compartment 1, the water flows through the row of holes 8 in the bottom of the partition 5 and then passes over the weir W1, to the right of which the water level is shown as L3. In compartment 3 the weir W2 defines a water level L4 and the difference in the levels L3 and L4 forms a head forcing the water downwardly again through the filter so that similar conditions apply to those already described in compartment 1. The water again flows through the row of holes 8 in the bottom of the filter and if the larger holes are arranged at the opposite end of the partition from those in the partition between compartments 1 and 2, a zigzag flow of water will be obtained as previously described. In compartment 4 a level L6 is maintained by the weir W3 and the difference between the level L5 in compartment 3 and the level L6 provides sufficient head to cause the water to flow through the filter 12 in compartment 3. Since the water becomes progressively cleaner and the filters in the successive compartments become progressively less clogged, it will be noticed that the head of water

necessary to force the water through each filter becomes progressively less.

After an extended period of operation the filters 12 will tend to become clogged, this occurring first in the filter in compartment 1 which removes a major proportion of the dirt. As clogging progresses, the head necessary to force the water through the filter increases and the level L1 will tend to rise. The partitions 5 are inter-changeable and each has small holes near its upper edge. When the level L1 in compartment 1 reaches these holes (not shown in the drawing) it over-flows into compartment 2 and this is a readily visible indication that it is time to change the filter. To facilitate this each filter element has a plastics handling strip 35 secured to the rim of the tray 13 and this enables the filter to be lifted out of the compartment in question without the operator having to touch the filter itself. Once a clogged filter has been removed as just described, it can be replaced by a clean filter and operation can proceed.

If, however, the over-flowing water is not noticed and the filter is not changed, the second compartment will fill up quite rapidly until the water starts to over-flow through the small holes at the top of the next partition into the third compartment. If this is still not noticed, the water will eventually over-flow into the fourth compartment and then run away through the outlet pipe 30. In other words, the indication that a filter change is necessary occurs in three stages. As already mentioned, the first filter separates a large proportion of the dirt from the water and will require changing most frequently. However, the second filter will ultimately become clogged and a similar warning will be given that it is necessary for it to be changed.

Ultimately the third filter will also have to be changed, warning being given in the same way.

Quite apart from the filter elements themselves having to be changed as they become clogged, the tank itself will also require periodic cleaning. For this purpose, the filtration operation must, of course, be shut down and the various components can then be removed from the tank without difficulty. The filter elements themselves are easily removable by use of the handling strips 35 and the partitions 5 may easily be slid out of their grooves and cleaned. The outlet pipe 30 may also easily be lifted out of position and since it has a relatively large cross-section may readily be cleaned by a brush. The continuous structure which forms the sloping bottoms of the compartments and the successive weirs is part of the structure of the tank and remains in situ, but since it forms a series of flat smooth surfaces it can, in the absence of the partitions 5 be cleaned without difficulty as can also the sides of the tank. Once clean, the various components can be re-inserted very quickly and operation resumed with a minimum of interruption.

C L A I M S

1. A filtration device for the continuous filtration of water from a fish tank comprising a tank divided into at least two compartments by a partition which is perforated towards its lower edge to permit flow from one compartment to the other, the first compartment having supports for a generally horizontal filter element and the second compartment including a weir extending to a level above that of the filter element in the first compartment so that during operation, when water flows into the first compartment and through the filter element, the water level will rise to that of the weir and the filter element will be completely submerged.

2. A filtration device according to claim 1, in which the filtration tank includes one or two additional compartments, each with its own generally horizontal filter, the additional partitions being perforated towards their lower edges and weirs being provided to ensure that each successive filter is completely submerged so that the flow is even and dead spots are avoided in operation.

3. A filtration device according to claim 2, in which there are four compartments, the first three of which are fitted with filters and the fourth of which includes a weir and an outlet for the filtered water.

4. A filtration unit according to any one of the preceding claims in which the partition or partitions is or are readily removable.

5. A filtration unit according to any one of the preceding claims in which each filter is provided with a handling strip.

6. A filtration unit according to any one of the preceding claims in which each filter comprises a

perforated plastics tray containing granulated carbon enclosed by a layer of plastics foam.

7. A filtration device for the continuous filtration of water from a fish tank substantially as described and as illustrated in the accompanying drawing.